

## CLAIMS

1. An image sensor device, comprising:
  - a QFN type leadframe having a central die attach flag and an outer bonding pad area having a plurality of bonding pads;
  - a sensor integrated circuit (IC) attached to the flag, the IC having a first surface with an active area and a peripheral bonding pad area, the peripheral bonding pad area including bonding pads;
  - a plurality of wires wirebonded to respective ones of the IC bonding pads and corresponding ones of the leadframe bonding pads, thereby electrically connecting the IC and the leadframe;
  - a plurality of stud bumps on the first surface of the IC;
  - a transparent cover disposed over the IC active area and resting on the stud bumps, the cover allowing light to pass therethrough onto the IC active area; and
  - a mold compound formed over the leadframe, wirebonds and a peripheral portion of the cover.
2. The image sensor device of claim 1, wherein the flag has a perimeter ring that forms a bond line having a height that is about the same as a thickness of the leadframe.
3. The image sensor device of claim 2, wherein the IC is attached to the flag with a low modulus adhesive disposed within the flag perimeter ring.
4. The image sensor device of claim 1, wherein the stud bumps are formed of gold.

5. The image sensor device of claim 4, wherein the stud bumps have a height of about 3 mils.

6. The image sensor device of claim 4, wherein the wires are made of gold.

7. The image sensor device of claim 1, further comprising a clear compound disposed between the IC active area and the cover.

8. The image sensor device of claim 7, wherein the cover is made of glass.

9. The image sensor device of claim 1, wherein the stud bumps are formed on the IC active area.

10. The image sensor device of claim 1, wherein the device has a height of about 40 mils.

11. An image sensor device, comprising:

a QFN type leadframe having a central die attach flag and an outer bonding pad area having a plurality of bonding pads, wherein the flag has a perimeter ring that forms a bond line having a height that is about the same as a thickness of the leadframe;

a sensor integrated circuit (IC) attached to the flag with a low modulus adhesive disposed within the flag perimeter ring, the IC having a first surface with an active area and a peripheral bonding pad area, the peripheral bonding pad area including bonding pads;

a plurality of gold wires wirebonded to respective ones of the IC bonding pads and corresponding ones of the leadframe bonding pads, thereby electrically connecting the IC and the leadframe;

a plurality of gold stud bumps formed on the active area of the first surface of the IC;

a clear compound disposed over the IC active area;

a transparent glass cover disposed over the clear compound on the IC active area and resting on the stud bumps, wherein light may pass through the cover and the clear compound onto the IC active area; and

a mold compound formed over the leadframe, wirebonds and a peripheral portion of the cover, wherein the device has a height of less than about 40 mils.

12. An image sensor device, comprising:

a QFN type leadframe having a central die attach flag and an outer bonding pad area having a plurality of bonding pads;

a sensor integrated circuit (IC) attached to the flag, the IC having a first surface with an active area, a non-active area and a peripheral bonding pad area, the peripheral bonding pad area including bonding pads;

a plurality of wires wirebonded to respective ones of the IC bonding pads and corresponding ones of the leadframe bonding pads, thereby electrically connecting the IC and the leadframe;

a clear compound disposed over the IC active area;

a transparent glass cover disposed over the clear compound on the IC active area, wherein light may pass through the cover and the clear compound onto the IC active area; and

a mold compound formed over the leadframe, wirebonds, IC wirebonds, IC non-active area and a peripheral portion of the cover.

13. A method of making an image sensor device, comprising the steps of:

providing a QFN type leadframe having a central die attach flag and an outer bonding pad area having a plurality of bonding pads, wherein the flag has a perimeter ring that forms a bond line having a height that is about the same as a thickness of the leadframe;

disposing a die attach material on the flag and within the perimeter ring;

attaching a sensor integrated circuit (IC) to the flag with the die attach material, the IC having a first surface with an active area and a peripheral bonding pad area, the peripheral bonding pad area including bonding pads;

electrically connecting respective ones of the IC bonding pads and corresponding ones of the leadframe bonding pads with a plurality of wires via wirebonding;

forming a plurality of stud bumps on the first surface of the IC;

placing a transparent cover over the IC active area such that the cover rests on the stud bumps, wherein light may pass through the cover and onto the IC active area; and

forming a mold compound over the leadframe, wirebonds and a peripheral portion of the cover.

14. The method of making an image sensor device of claim 13, wherein the stud bumps are formed of gold and have a height of about 3 mils.

15. The method of making an image sensor device of claim 14, wherein the wires are gold.

16. The method of making an image sensor device of claim 13, further comprising the step of:

dispensing a clear compound over the IC active area prior to placing the cover on the stud bumps, wherein the compound thickness is about the same as a height of the stud bumps.

17. The method of making an image sensor device of claim 16, wherein the cover comprises glass.

18. The method of making an image sensor device of claim 13, further comprising the step of:

after attaching the IC to the flag, placing the leadframe on a stage curing heat block having a vacuum hole at a central position under the flag.

19. The method of making an image sensor device of claim 18, further comprising the steps of:

initiating a vacuum force that causes the die attach material to collapse into the hole; and  
curing the die attach material.

20. The method of making an image sensor device of claim 19, wherein the vacuum force collapsing the die attach material into the hole and the curing step form a bump that protrudes from the die attach material.

21. The method of making an image sensor device of claim 20, further comprising the step of:

after forming the mold compound over the leadframe, wirebonds and the peripheral portion of the cover, collapsing the bump to cause a force for maintaining the cover in contact with a mold cavity.

22. A method of making an image sensor device, comprising the steps of:

providing a QFN type leadframe having a central die attach flag and an outer bonding pad area having a plurality of bonding pads, wherein the flag has a perimeter ring that forms a bond line having a height that is about the same as a thickness of the leadframe;

disposing a die attach material on the flag and within the perimeter ring;

attaching a sensor integrated circuit (IC) to the flag with the die attach material, the IC having a first surface with an active area and a peripheral bonding pad area, the peripheral bonding pad area including bonding pads;

placing the leadframe on a stage curing heat block having a vacuum hole at a central position under the flag;

electrically connecting respective ones of the IC bonding pads and corresponding ones of the leadframe bonding pads with a plurality of wires via wirebonding;

dispensing a clear compound over the IC active area;

placing a transparent cover over the clear compound on the IC active area, wherein light may pass through the cover and the compound and onto the IC active area; and

forming a mold compound over the leadframe, wirebonds and a peripheral portion of the cover.

23. The method of making an image sensor device of claim 22, further comprising the steps of:

initiating a vacuum force that causes the die attach material to collapse into the hole; and

curing the die attach material.

24. The method of making an image sensor device of claim 23, wherein the vacuum force collapsing the die

attach material into the hole and the curing step form a bump that protrudes from the die attach material.

25. The method of making an image sensor device of claim 24, further comprising the step of:

after forming the mold compound over the leadframe, wirebonds and the peripheral portion of the cover, collapsing the bump to cause a force for maintaining the cover in contact with a mold cavity.